Appln No. 09/996,233
Reply to Office Action of June 30, 2005

Amendments to the Claims:

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1. (Previously Presented) An optical communications receiver for receiving and processing turbulence degraded optical signals comprising:

a detector array comprising ~~a plurality of detector elements~~ a grid array of NxM detector elements, where N is ≥ 2 and M is ≥ 2 for detecting a point spread function characteristic of the received optical signal, wherein each of the plurality of detector elements outputs a detector output characteristic of a portion of the point spread function;

a signal processor for real-time processing the detector outputs to optimize the performance of the optical communications receiver by separating a plurality of performance enhancing detected signals from a plurality of performance degrading detected signals, the signal processor being further configured to:

receive the detector outputs from the plurality of detector elements and estimate a signal intensity from each detector output,

select the performance enhancing detector outputs by selecting the detector outputs containing sufficient signal intensity to improve the performance of the optical detector, and

combine the performance enhancing detector outputs into a single processed signal characteristic of the instantaneous point spread function; and

a decoder for detecting the received optical signal in the processed signal and outputting a decoded optically transmitted symbol to a user.

2. (Original) An optical receiver as described in claim 1 further comprising a collecting aperture for collecting the transmitted signals from an external source.

3. (Original) An optical receiver as described in claim 1 further comprising focusing optics for focusing the received signals onto the detector.

4. (Cancelled).

5. (Original) An optical receiver as described in claim 1 wherein the detector comprises a grid array of NxM detector elements, where N is ≥ 4 and M is ≥ 4.

6. (Original) An optical receiver as described in claim 1 wherein the detector elements are selected from the group consisting of: photomulipliers, avalanche photodiodes and PIN diodes.

7. (Original) An optical receiver as described in claim 1 wherein the signal processor operates on the received optical signal at a rate equal to or greater than the Nyquist rate.

8. (Original) An optical receiver as described in claim 1 wherein the signal processor processes the received optical signal by weighting the detector outputs based on a function of a characteristic signal to noise ratio wherein the function is either a logarithmic function or an approximation of a logarithmic function.

9. (Original) An optical receiver as described in claim 1 wherein the signal processor processes the received optical signal by ranking the detector outputs and utilizing only those detector outputs with the greatest signal content.

10. (Original) An optical receiver as described in claim 1 wherein the received optical signal is transmitted in an intensity modulated transmission protocol.

11. (Original) An optical receiver as described in claim 1 wherein the received optical signal is transmitted in a protocol selected from the group consisting of: binary pulse-position modulation, *M*-ary pulse-position modulation and on-off key modulation.

12. (Currently Amended) A method for optimizing an optical communications receiver by eliminating atmospheric turbulence degradation of signals comprising:

detecting an incoming optical signal with ~~a plurality of detector elements~~ a grid array of NxM detector elements, where N is ≥ 2 and M is ≥ 2, such that each detector element outputs a detector output; and

processing said detector outputs in real time at a rate equal to or greater than the Nyquist rate of the detected signal, wherein the step of processing further comprises:

estimating the signal intensity of each of the detector outputs;

analyzing the detector outputs to determine which detected signals have sufficient signal intensity to improve the performance of the optical communications receiver;

selecting those performance enhancing detector outputs;

combining the performance enhancing detector outputs into a single processed signal; and

decoding the processed signal to determine the data content of the incoming optical signal.

13. (Original) A method as described in claim 12 wherein the step of analyzing comprises calculating weighted log-likelihood functions for each detector output and comparing the weighted log-likelihood functions for each detector output to determine the greatest log-likelihood function.

14. (Original) A method as described in claim 12 wherein the step of analyzing comprises ranking the detector outputs based on their signal intensity, and

wherein the step of comparing comprises computing the probability error for each successive set of detector elements plus a measured background noise for each of the detector elements.

15. (Original) A method as described in claim 12 wherein the step of analyzing comprises ranking the detector outputs based on their signal intensity, and wherein the step of comparing comprises assigning a weighting value of 1 to those detector outputs above a specified threshold of received optical signal and assigning a weighting value of 0 to those outputs below the specified threshold to create an effective signal mask.

16. (Original) A method as described in claim 12 wherein the step of analyzing comprises ranking the detector outputs based on their signal intensity, and wherein the step of comparing comprises assigning a weighting value to each of the detector outputs according to an approximation of a logarithmic rate for each of the detector outputs.

17. (Original) A method as described in claim 12 wherein the step of comparing comprises calculating a signal-to-noise ratio measure for each detector output and assigning a weighting value to the outputs based on those ratios.

18. (Currently Amended) A method for optimizing an optical communications receiver by eliminating atmospheric turbulence degradation of signals comprising:

detecting an incoming optical signal with ~~a plurality of detector elements~~ a grid array of NxM detector elements, where N is ≥ 2 and M is ≥ 2, such that each detector element outputs a detector output; and

optimizing the detector outputs in real time at a rate equal to or greater than the Nyquist rate of the detected signal, utilizing an optimally weighted signal processing,

the optimally weighted signal processing multiplying each detector output with a weighting factor for optimizing optical communications performance.

19. (Currently Amended) A method for optimizing an optical communications receiver by eliminating atmospheric turbulence degradation of signals comprising:

detecting an incoming optical signal with ~~a plurality of detector elements~~ a grid array of NxM detector elements, where N is ≥ 2 and M is ≥ 2, such that each detector element outputs a detector output; and

determining a set of detector outputs in real time at a rate equal to or greater than the Nyquist rate of the detected signal, utilizing an adaptive synthesized single-detector signal processing configured to optimize optical communications performance.

20. (Currently Amended) A method for optimizing an optical communications receiver by eliminating atmospheric turbulence degradation of signals comprising:

detecting an incoming optical signal with ~~a plurality of detector elements~~ a grid array of NxM detector elements, where N is ≥ 2 and M is ≥ 2, such that each detector element outputs a detector output; and

determining a set of detector outputs in real time at a rate equal to or greater than the Nyquist rate of the detected signal, utilizing signal-to-noise processing configured to optimize optical communications performance.

21. (Previously Presented) The optical communications receiver of claim 1, wherein the detector array is a wide-band communications detector array, and the signal processor is configured to optimize a bit error rate of the optical communications receiver.